Software Review Job Aid - Supplement #1

Typical Roles and Responsibilities of the FAA Software Team

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1.0 Introduction

This document describes the roles and responsibilities of the FAA's software team. The team may include the following members:

- Aviation Safety Engineer responsible for the software approval (SW-ASE),
- Chief Scientific and Technical Advisor (CSTA),
- Technical Specialist (TS),
- Directorate personnel, and/or
- Headquarters personnel.

The typical roles and responsibilities for each team member will be discussed below.

2.0 Roles and Responsibilities for the SW-ASE

The SW-ASE is the ACO engineer responsible for software review and approval. This section describes the roles and responsibilities for SW-ASE's for each of the following processes:

(1) Type Certificate, Amended Type Certificate, Supplemental Type Certificate (TC/ATC/STC) Process
(2) Production Certificate (PC) Process
(3) Parts Manufacturer Approval (PMA) Process
(4) Technical Standard Order Authorization (TSOA) Process
(5) Aircraft Certification Systems Evaluation Program (ACSEP) Process
(6) Certificate Management Process
(7) Designee Management Process

2.1 Roles and Responsibilities of SW-ASE's in Software Approvals under the TC/ATC/STC Processes

The process for approving software in TC/ATC/STC projects involves three roles for the SW-ASE: (1) communicating with the applicant and planning the project, (2) implementing the review and approval, and (3) determining the future level of involvement based on lessons learned.

2.1.1 Communication and Planning

At the beginning of a project, the SW-ASE should carry out communication with the applicant in order to plan the workload, number of software reviews, amount of delegation, etc. The roles and responsibilities of the SW-ASE during the communication and planning process are shown in Table 1.

TABLE 1 - Roles and Responsibilities for SW-ASE's in the Communication and Planning for the Software Aspects of the TC/ATC/STC Process
• Participate in Type Board/Familiarization meeting. • Determine level of FAA involvement for software aspects of project. • Assess if unique design or new technology is being proposed (to determine if CSTA, TS, Directorate personnel, or HQ personnel should be involved). • Determine designee utilization and resource availability. • Coordinate software effort with Project Manager. • Determine software level(s) based on System Safety Assessment (SSA). • Determine the software life cycle data to be submitted. • Review PSAC. • If necessary, review the Software Configuration Management Plan (SCMP), the Software Quality Assurance Plan (SQAP), the Software Development Plan (SDP), and the Software Verification Plan (SVP). • Provide comment to applicant and obtain resolution of plan deficiencies. • Provide software input to CPP or equivalent project level plan, including designee delegation plans and interactions during the project. • Resolve any discrepancies in plans with applicant.

2.2.2 Implementation

Implementation of a project is the process of assuring the applicant's software life cycle processes comply with their approved plans and approving their data submittals after determining compliance with DO-178B or other acceptable means. Implementation may require on-site software reviews, desk-top reviews, and review of designee findings by the SW-ASE. SW-ASE's roles and responsibilities for implementation of the software review and approval are shown in Table 2.

TABLE 2 - Roles and Responsibilities of SW-ASE's in the Implementation of the TC/ATC/STC Process
• Approve PSAC and, if necessary, SCMP, SQAP, SDP, and SVP. • Monitor the applicant's compliance to their plans. • Resolve applicant process discrepancies with the approved software plans and DO-178B or acceptable alternative. • Coordinate tasks to support desk-top and on-site reviews. • Perform on-site review, desk-top review, designee delegation, or a combination. • Coordinate with systems certification Software Team. • Identify and request specific conformity items. • Approve Software Configuration Index (SCI) and Software Accomplishment Summary (SWAS). • Identify discrepancies and coordinate resolution. • Identify process improvement opportunities.

2.2.3 Future Planning and Involvement

At the end of each software review or approval, the SW-ASE may want to identify areas for both the FAA and the applicant to improve upon.

2.3 Roles and Responsibilities of SW-ASE's in the Software Aspects of the Production Certificate Process.

The Production Certificate (PC) process begins with the application. The normal process for issuance of a PC is to follow Order 8120.2A, "Production Approval and Surveillance Procedures." The cognizant MIDO, MISO, or CMO may conduct a preliminary audit of the applicant's Quality Control (QC) system and production facilities to ensure compliance with the applicable Code of Federal Regulations (CFR) and policy. The PC project may be assessed during the preliminary audit to determine whether the applicant is involved in airborne software development and computer aided design, manufacturing, inspection, and test (CADMIT) tools. The FAA assesses the project to ensure that the airborne and CADMIT software is addressed in the QC and SCM systems. A Production Certification Board (PCB) may be convened for initial production approvals to evaluate the preliminary audit findings and recommendations from the cognizant MIDO, MISO, or CMO.

The issuance of the PC is primarily the responsibility of the MIDO, MISO, or CMO. However, the SW-ASE might be requested to assist the manufacturing office in evaluation of automated inspection or test equipment used to verify type design.

2.4 Roles and Responsibilities of SW-ASE's in the Software Aspects of the Parts Manufacturer Approval (PMA) Process.

The PMA process begins with the application for PMA. The normal process for issuance of PMA is to follow Order 8110.42, "Parts Manufacturer Approval Procedures." This process applies to anyone producing replacement or modification parts for sale for installation on type certified products. Applicants may obtain design approval on replacement or modification parts through Identicality, or Licensing Agreements. Production manufacturing approval is obtained through the MIDO or MISO inspector's acceptance of the applicant's fabrication inspection system and evaluation of applicant's facility to determine applicant's compliance to 14 CFR part 21, Subpart K.

Since software has some unique characteristics, chapter 6 of Order 8110.SW, Guidelines for the approval of Field-Loadable Software by Finding Identicality through the Parts Manufacturer Approval Process, identifies the PMA process for field-loadable software. Field-loadable software is where PMAs are typically desired for software. At present, the test and computation approach is not supported for PMA software.

Table 3 describes the roles and responsibilities for the SW-ASE to be performed for: (1) PMA application, (2) approval by identicality with licensing agreement, and (3) approval

by identicality without licensing agreement. This specifically applies to PMA for software. Reference Order 8110.SW, as needed.

Function	SW-ASE Roles and Responsibilities
PMA Application	• Determine level of FAA software involvement. • Determine designee utilization and resource availability. • Coordinate software effort with Project Manager. • Coordinate with the systems certification Software Team. • Establish certification basis. • Participate in familiarization and technical meetings. • Review applicant's software plans. • Determine if unique design or new technology warrants coordination with CSTA, TS, Directorate, or Headquarters personnel. • Resolve plan discrepancies with the applicant. • Perform on-site reviews, desk-top reviews, designee delegation, or combination, as necessary. • Identify discrepancies. • Review SCI and SWAS.
Identicality With Licensing Agreement	• SW-ASE is typically not involved, unless requested by the manufacturing office.
Identicality Without Licensing Agreement	• Specify software life cycle data to be submitted. • Review submitted software life cycle data and resolve discrepancies with applicant. • Verify approved software configuration.

Table 3. Roles and Responsibilities for SW-ASE's in the PMA Process

2.5 Roles and Responsibilities of SW-ASE's in the Software Aspects of the Technical Standard Order Authorization (TSOA) Process.

The TSOA is a joint authorization by both the ACO and MIDO or MISO, and has many similarities to the TC/ATC/STC process. The normal process to obtain a TSOA is to follow Order 8150.1A. However, the TSOA process also has some unique characteristics that are described below.

2.5.1 Description of the TSOA Process

The TSOA is an authorization to manufacture equipment that meets TSO-specified requirements; it is not approval to install the equipment on an aircraft or engine. The design portion of the TSOA process is responsibility of the applicant. The applicant submits the TSO data package and a statement of compliance to the ACO. Most TSO authorizations are granted based on a review of the data package, reliance on the applicant's statement of compliance, and an evaluation of the capability of the applicant

to produce the TSO equipment. FAA acceptance of TSO systems with embedded software is based on a review of the TSO data package for compliance with RTCA DO-178[] or other acceptable means, as well as the applicant's statement of compliance that the TSO article meets the performance specifications of the TSO. Once the TSO is granted, the TC of the aircraft may need to be amended or supplemented to allow the TSOA equipment to be installed on the aircraft. Granting a TSOA is, in and of itself, not sufficient substantiation to amend a TC; installation substantiation is required also.

The TSOA process may begin with an initial familiarization meeting, a letter of intent or application, where the applicant's project schedule and plans are discussed. Applicants should be encouraged to seek software expertise and FAA involvement early in the project. The FAA can provide guidance on software compliance and certification concerns. The applicant may want to discuss with the FAA such areas as: the certification plans; especially the PSAC, the system safety assessment, human factors issues, failure condition categories, software levels, software and hardware partitioning, etc.

The SW-ASE evaluation begins after the submission of the completed TSO data package. TSO requirements sometimes specify the data submittal requirements. If they don't, the applicant should submit the PSAC, SCI, and SWAS. The ACO SW-ASE may request additional data be submitted. The evaluation consists of the following:

1. review of applicant's statement of compliance;
2. review TSO data submittals, including software life cycle data; and
3. recommend approval or denial of deviations.

The manufacturing office will evaluate the QC manual for compliance with the applicable CFR, policy, and verification of implementation compliance with the manual.

2.5.2 Evaluating Capability

As part of assessing the applicant's capability to make statements of compliance, the FAA must assess the company's capability to produce software in compliance with the appropriate software level of DO-178[]. The assessment may be accomplished through an FAA software review conducted by a team. Once the FAA has determined the applicant capable, the applicant may be deemed "capable" for that level of software.

2.5.3 Issuance of a TSOA

If the Software Team finds all submittals from the applicant acceptable, the TSOA is issued. If the applicant's request is denied, the reason for denial should be communicated to the applicant. When acceptable corrections are made, the TSOA may be issued. Deviations are evaluated by engineering and a recommendation to approve or deny, with substantiating data, is provided to Headquarters (AIR-100) for concurrence. AIR-100 will communicate approval or denial of the deviations to the local ACO who provides a formal response to the applicant.

2.5.4 Roles and Responsibilities in the TSOA Process

Table 4 below describes roles and responsibilities of the SW-ASE in TSOA project familiarization and evaluation.

TABLE 4 - Roles and Responsibilities for SW-ASE for Software Aspects of the TSOA Project
• Review applicant statement of compliance and TSO data package submitted with TSO application. • Participate in familiarization meeting • Determine software level of FAA involvement for TSO. • Review software life cycle data of TSO data package. • Assess software level acceptability. • Request additional software data to be submitted as necessary to substantiate compliance. • Perform on-site or desk reviews, as necessary to substantiate compliance. • Evaluate deviation requests, send recommendations to AIR-100, and forward resolution to applicant. • Resolve any discrepancies with the applicant. • Send TSOA letter to applicant.

2.6 Roles and Responsibilities of SW-ASE's in the Software Aspects of the ACSEP Process

The production approval holder's SQA and SCM processes and Quality Control system are evaluated to the criteria found in Order 8100.7, "Aircraft Certification Systems Evaluation Program (ACSEP)." Individuals assigned to review the software sub-system might comprise of one or more SW-ASE's and/or Aviation Safety Inspectors (ASI), possibly flight test pilots. If more than one individual is participating in the review, than one will be assigned the role of software team leader. Table 5 defines the roles and responsibilities for the SW-ASE or ASE who is performing the software aspects of ACSEP evaluations.

TABLE 5 - Roles and Responsibilities for Software Aspects of the ACSEP Evaluation
• Examine the software quality process per the ACSEP order. • Document findings and observations. • Monitor corrective actions.

2.7 Roles and Responsibilities for SW-ASE's in the Software Aspects of the Certificate Management Process

The Certificate Management process begins with the issuance of a new approval, a scheduled visit, or information from manufacturing. Certificate Management for systems with software (and the scheduled visits portion of certificate management) is an activity for both engineering and manufacturing inspection. Certificate Management is an ongoing process that applies to TC/ATC/STC, PC, TSOA, and PMA products.

Certificate Management of software systems should be proactive and may include:

- evaluation of the software development processes, if not previously reviewed (TC/ATC/STC/TSOA);
- evaluation of the SCM change process (e.g., design change, change control, baseline change, specification change notices, etc.);
- an evaluation of the SCM data retention and retrieval;
- verification that the software can be built, linked, and loaded into production units using approved procedures;
- analysis of product service history, including problem reports, accident/incident databases, Airworthiness Directives databases, System Deficiency Report databases to aid in determining the quality of the original development subsequent changes. This provides feedback to FAA manufacturing and engineering offices for continuous improvement activities;
- an assurance that manufacturing, test, and inspection software is controlled in compliance with the QA system and SCM; and
- Reevaluate SQA and SCM processes to ensure continued acceptability.

The above activities may result in a report of findings relevant to compliance with Order 2150.3A, "Compliance and Enforcement Program", from the ACO or MIDO.

Table 6 defines the typical roles and responsibilities for the SW-ASE for the software aspects of Certificate Management.

TABLE 6 – SW-ASE Roles and Responsibilities Certificate Management Process
• Review Service Difficulty Reports for software related trends. • Approve Service Bulletins. • Draft Airworthiness Directives. • Discuss SQA and SCM deficiencies with applicant. • Evaluate the software life cycle processes, if problems arise.

2.8 Roles and Responsibilities for SW-ASE's in the Software Aspects of the Designee Management Process

Much of the software aspects of certification are delegated to the Designated Engineering Representative (DER). The process of managing designees who perform software functions needs to take into consideration the following:

(1) Designee qualification, selection, and orientation.
(2) Oversight of designee usage on projects.
(3) Oversight of designee approval and activities.
(4) Designee renewal and evaluation.
(5) Training of designees.

Table 7 defines the roles and responsibilities for the Designee advisor and SW-ASE to be performed for the software aspects of Designee Management.

TABLE 7 - Roles and Responsibilities of SW-ASE for Designee Management
• Evaluate designee qualifications to the criteria of the appropriate Order. • Participate in training and mentoring activities to prepare the designees. • Apply the designee appointment and renewal procedures required by FAA Orders. • Evaluate level of designee activity.

3.0 ROLES AND RESPONSIBILITIES FOR SOFTWARE CSTA

The CSTA provides professional technical guidance, advice and assistance within the FAA and to the aviation industry. They are the FAA's direct link to an extensive professional network in the research and development community, professional and academic organizations, private industry, other government and regulatory authorities, and national and international experts in the field of software. The CSTA operates in the role of technical leader and certification Software Team advisor. The roles and responsibilities of the CSTA in both capacities are described below:

3.1 CSTA Technical Leader Roles and Responsibilities:

- Consults on programs that are applying new technology.
- Initiates and serves on committees regarding standardization of new technology areas.
- Addresses issues that require precedent setting approaches to policy and means of compliance.
- Assists Directorate and Headquarters staffs in understanding technology and related issues in order to develop rules and policy guidance.
- Educates Headquarters, Technical Specialists, Directorate Staff, SW-ASE's, SW-ASI's and Designees regarding new technology compliance issues.
- Conducts research and development in the areas of specialty and responsibilities.

3.2 CSTA Certification Software Team Advisor Roles and Responsibilities:

- Attends familiarization meetings, when requested.
- Advise the Software Team on issues that require precedent setting approaches to policy and means of compliance.
- Participates in Special Certification Reviews, Critical Design Reviews, and Multiple Expert Opinion Software Teams.
- Participates in formal technical Software Team meetings.
- Provides timely response to Software Team for methods of compliance or precedent-setting design features.
- Assists SW-ASE, SW-ASI, and applicant in understanding new technology and related issues and identifying means of compliance.

4.0 ROLES AND RESPONSIBILITIES FOR SOFTWARE TS

The TS provides technical expertise to the FAA in the area of software and acts as the focal point for issues of software technology. The TS is responsible for being current on the latest technologies, methods, and policies by working closely with the CSTA, Standards and MIO staff of the Directorates, and Headquarters. The TS operates in the role of technical expert and certification Software Team member. The roles and responsibilities of the TS in each of these capacities are described below:

4.1 TS Technical Expert Roles and Responsibilities:

- Assists ACO's, MIDO's, Directorate Staff, and Headquarters in establishing policy and procedures regarding software issues.
- Participates in meetings with the CSTA and industry.
- Mentoring and assists SW-ASE and SW-ASI on software issues.
- Provides an evaluation of the SQA subsystem when requested to participate on an ACSEP review.
- Participates on industry Software Teams to establish standards and guidance.
- Provides expertise within discipline.

4.2 TS Certification Software Team Member Roles and Responsibilities:

- Participates in projects involving new technology or new application of technology.
- When requested by ACO, evaluates software life cycle processes during certification projects.
- When requested by ACO, evaluates SCM and SQA processes for airborne systems and manufacturing operations to assure post-certification compliance.
- Identifies compliance issues.
- When requested by ACO, conducts software reviews and inspections.
- Provides technical recommendations to SW-ASE's and SW-ASI's.

5.0 ROLES AND RESPONSIBILITIES FOR DIRECTORATE STAFF

The Directorate Staff consists of both the standards staff and the manufacturing inspection office. The Directorate Staff provides part-specific and project-specific rules and policy to the certification Software Team. They are also the focal point within the Directorate for policy.

5.1 The Directorate Staff assumes these roles and responsibilities:

- Provides input to Headquarters to ensure national policy is consistent with Directorate (Part 23, 25, 27, 29, 33, 35) policy.
- Participate in familiarization meetings for significant projects.
- Identifies and clarifies software policy for the ACO's and MIDO's.
- Assists the ACO's and MIDO's in formalizing their concerns with policy implementation problems to Headquarters.
- Encourages and ensures standardized application of national policy and regulations.
- Encourages the definition of design features and methods of compliance early in the project.
- Represents the Directorate at technical forums and meetings that involve software.
- Assists Headquarters in the development of regulations and national policy.
- Recommends issues requiring national policy to Headquarters.
- Participates in software reviews, as requested.
- Provides software process evaluation expertise as project Software Team member.
- Works with the CSTA and TS on national software issues.
- Serves as technical expert, as requested.

6.0 ROLES AND RESPONSIBILITIES FOR HEADQUARTERS STAFF

The Headquarters staff assumes the following roles and responsibilities for software aspects of certification:

- Serves as focal point working with Directorate Staff, CSTA, TS, ACO's and MIDO's to ensure policy and guidance standardization among all Directorates.
- Develops new policy, guidance, and regulations based on input from CSTA, TS, Directorate Staff, ACO's, MIDO's, and Industry.
- Interprets and explains policy and guidance to the Directorate Staff, ACO's and MIDO's
- Serves as liaison among different FAA communities.
- Participates in projects that require changes or additions to national software policy.
- Develops national training programs to promote standardization throughout AIR.
- Sponsors national software standardization conferences.
- Manages Research and Development programs involving software.
- Promotes international harmonization.
- Serves as the federal representative on national software committees.
- Works closely with Headquarters management Software Teams.
- Serves as technical expert during a software review, as requested.